OCCUPATIONAL ANALYSES SERIES

Heavy Duty Equipment Technician

2004

Human Resources and Skills Development Canada
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Heavy Duty Equipment Technician

2004

Trades and Apprenticeship Division

Human Resources
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The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Occupational Analysis as the national standard for the occupation of heavy duty equipment technician.

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OTHER RELATED OCCUPATIONAL TITLES

This analysis covers tasks performed by a heavy duty equipment technician whose occupational title has been identified by some provinces and territories of Canada under the following names:

- Heavy Equipment Service Technician
- Heavy Duty Equipment Mechanic
- Heavy Equipment Technician
- Heavy Equipment Technician – Heavy Duty Equipment Mechanic (Off Road)

LIST OF PUBLISHED OCCUPATIONAL ANALYSES*

TITLE	NOC** Code
Appliance Service Technician (1997)	7332
Aquaculture Technician (1977)	2221
Arts Administrator (1989)	0114
Automotive Painter (1995)	7322
Automotive Service Technician (1998)	7321
Automotive Technician – Automatic Transmission (1990)	7321
Automotive Technician – Electrical/Electronics (1992)	7321
Automotive Technician – Engine Repair and Fuel Systems (1989)	7321
Automotive Technician – Front-End (1989)	7321
Automotive Technician – Manual Transmission, Driveline and Brakes (1990)	7321
Aviation Machinist (1994)	7231
Baker (1997)	6252
Blaster (Surface) (1987)	7372
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (1998)	7271
Cement Finisher (1995)	7282
Construction Electrician (2003)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician – Consumer Products (1997)	2242
Electronics Technician Vol. I (1986) (Video Equipment)	2242
Electronics Technician Vol. II (1986) (Audio Equipment)	2242
Electronics Technician Vol. III (1986) (Computer Equipment)	2242

* **Red Seal analyses are indicated in bold**
** **National Occupational Classification**

Electronics Technician Vol. IV (1986) (Office Equipment)	2242
Electronics Technician Vol. VI (1986) (Communication Equipment)	2242
Electronics Technician Vol. VII (1986) (Signaling Equipment)	2242
Electronics Technician Vol. VIII (1986) (Navigation Equipment)	2242
Electronics Technician Vol. IX (1986) (Video Game Equipment)	2242
Electronics Technician Vol. X (1987) (CADD Equipment)	2242
Electronics Technician Vol. XI (1987) (CAM Equipment)	2242
Electronics Technician Vol. XII (1987) (Robotics Equipment)	2242
Electronics Technician Vol. XIII (1987) (Biomedical and Laboratory Equipment)	2242
Electronics Technician Vol. XIV (1987) (Industrial Process-Control Equipment)	2243
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (1997)	7295
Glazier (2004)	7292
Hairstylist (1997)	6271
Heating (Gas and Oil) Servicer – Commercial and Industrial (1978)	7331
Heavy Duty Equipment Technician (2004)	7312
Industrial Electrician (2003)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284
Logistics (1992)	0713
Machinist (1998)	7231
Major Electrical Appliance Repairer (1984)	7332
Metal Fabricator (Fitter) (2003)	7263

Mobile Crane Operator (1997)	7371
Motorcycle Mechanic (1995)	7334
Motor Vehicle Body Repairer (Metal and Paint) (1997)	7322
New Home Builder and Residential Renovation Contractor (1992)	0712
Oil Burner Mechanic (1997)	7331
Painter and Decorator (2000)	7294
Partsperson (1995)	1472
Plumber (2003)	7251
Power Engineer (1997)	7351
Powerline Technician (2004)	7244
Recreation Vehicle Mechanic (2000)	7383
Refrigeration and Air Conditioning Mechanic (2004)	7313
Roofer (1997)	7291
Sheet Metal Worker (1997)	7261
Sprinkler System Installer (2003)	7252
Steamfitter – Pipefitter (1996)	7252
Tilesetter (2004)	7283
Tool and Die Maker (1997)	7232
Transport Trailer Technician (2003)	7321
Truck and Transport Mechanic (2000)	7321
Welder (2004)	7265

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FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Skills Development Canada sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;
- to identify those tasks that are performed by skilled workers in every province and territory;
- to develop instruments for use in the preparation of interprovincial standards "Red Seal" examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility, in Canada, of apprentices and skilled workers;
- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators. This draft analysis identifies all the tasks performed in the occupation.

The draft is translated and reviewed by the NOA development team of HRSDC. A copy of this analysis is then forwarded to provincial/territorial authorities for validation by specialists in the field. Their recommendations are assessed and incorporated into the final draft which also includes the identification of the common core tasks performed in the occupation.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

BLOCK – is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

TASK – is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

SUB-TASK – is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The elements of skill and knowledge that an individual must acquire to adequately perform the task are identified under this heading.

Trends

Any shifts or changes in technology that affect the block are identified under this heading.

Related Components

All components of tasks being undertaken by the heavy duty equipment technician in a specific block are identified within this heading.

Tools and Equipment

All tools and equipment necessary for the heavy duty equipment technician to perform the work on all given tasks identified within the block.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-committee developed a method for validating the Red Seal national occupational analyses.

A draft of the analysis is sent to all provinces/territories for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the national occupational analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Red Seal examinations.

DEFINITIONS

YES:	the sub-task is performed by workers in the occupation in a specific jurisdiction.
NO:	the sub-task is not performed by workers in the occupation in a specific jurisdiction.
BLOCK %:	the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each block of the analysis.
TASK %:	the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each task of the analysis.
NV:	Not Validated by a province/territory.
ND:	Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL:	Newfoundland and Labrador
NS:	Nova Scotia
PE:	Prince Edward Island
NB:	New Brunswick
QC:	Quebec
ON:	Ontario
MB:	Manitoba
SK:	Saskatchewan
AB:	Alberta
BC:	British Columbia
NT:	Northwest Territories
YT:	Yukon
NU:	Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If 70% of the responding jurisdictions (excluding NVs and NDs) perform a sub-task, it shall be considered common core.

Interprovincial Red Seal examinations are based on the common core identified through this validation process. This process identifies what will be assessed through the interprovincial examination.

BLOCKS AND TASKS WEIGHTING (APPENDIX C)

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, assigns percentages to blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the NOA development team who then analyzes the data and develops this appendix which provides the individual jurisdictional validation results as well as the national averages of all responses.

PIE CHART (APPENDIX D)

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE HEAVY DUTY EQUIPMENT TECHNICIAN OCCUPATION

A heavy duty equipment technician is a tradesperson who possesses the full range of knowledge, abilities and skills required to diagnose, repair, adjust, overhaul, maintain, operate and test mobile heavy duty off-road equipment.

Heavy duty equipment technicians are employed by companies that own and operate heavy equipment, heavy equipment dealerships, rental and service companies, construction contractors, forestry companies, mining companies and government departments that service and repair their own equipment. Technicians can work in the following industries: construction, forestry, mining, marine, oil and gas, material handling, landscaping and land clearing. Many heavy duty equipment technicians have experience on a wide variety of equipment types and manufacturers.

Although it is recognized that heavy duty equipment technicians work with different prime movers such as electrical, the focus of this analysis is based on the internal combustion engine as the prime mover.

Heavy duty equipment technicians work in the full range of environmental conditions: from comfortable shops to remote sites where inclement weather can affect the technician's performance of his/her duties. Good physical condition and agility are important because the work often requires considerable standing, bending, crawling, lifting, climbing, pulling and reaching.

Due to the size and complexity of the equipment, safety is of prime importance. Technicians must be conscious of the impact on people, equipment, work area and environment when performing their work. There is some risk of injury when working with heavy equipment.

Though not described in this analysis as knowledge or abilities, some important attributes of the heavy duty equipment technician are: mechanical and mathematical aptitude, an ability to communicate effectively, to work with little or no supervision, to work as a team player and to plan and work sequentially. This analysis recognizes similarities or overlaps in the work of other tradespersons, such as automotive service technicians, agricultural equipment technicians, truck and transport mechanics and truck trailer repairers.

Experienced heavy duty equipment technicians may advance to shop supervisor or service manager positions. With additional training they can transfer their skills and knowledge to positions in sales, purchasing, planning or preventative maintenance or related occupations such as truck and transport mechanic, agricultural equipment technician, truck trailer repairer, aircraft maintenance engineer, industrial mechanic (millwright) or automotive service technician.

OCCUPATIONAL OBSERVATIONS

Some significant observations and trends emerged from the national occupational analysis of the heavy duty equipment technicians' occupation. These observations and trends are briefly outlined in this section.

The computer is increasingly being used for diagnostics, function calibration, programming, service and parts information. The use of computerized equipment has raised the level of troubleshooting ability required by the technician. This in turn requires higher levels of education and continuous training for the technician.

Satellite monitoring and diagnosing of machinery has been introduced and will become more widespread in the future. The use of Global Positioning System (GPS) and wireless technology has been introduced to machine operation and repair. The use of remote control machinery is increasing in the mining and construction sectors.

More emphasis is being placed on the safe handling, disposal, storage and recycling of toxic or environmentally hazardous materials.

Increasing use of multi-function/attachment equipment requires the technicians to have a broader ability to operate and repair.

Regular predictive and preventative maintenance is being emphasized to reduce downtime and costs related to major failures. However, some heavy equipment remains in service to the point of breakdown before having repairs initiated.

In an effort to maintain high safety standards, instruction in Workplace Hazardous Material Information Systems (WHMIS) and Occupational Health and Safety (OH&S) are becoming mandatory for individuals working in the trade. First aid training is also becoming mandatory in some jurisdictions.

SAFETY

Safe working procedures and conditions, accident prevention and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties are aware of circumstances or conditions that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is recognized that the duties of a heavy duty equipment technician are inherently dangerous and often performed in dangerous environments. A safety-conscious attitude and safe work practices will contribute to a healthy, safe and accident-free work environment.

It is imperative to apply and be familiar with the Workplace Hazardous Materials Information System (WHMIS), Occupational Health and Safety Act and Regulations. As well, it is essential to identify workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspects relating to each task and sub-task are included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Trends: *There is an increased use of highly specialized tools.*

Related Components: Applies to all components.

Tools and Equipment: See appendix A.

Task 1 **Uses tools and equipment.**

Sub-task

1.01 **Uses hand tools, power tools and equipment.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.01.01 knowledge of types of tools such as hand tools and power tools

1.01.02 knowledge of applications of tools and equipment

1.01.03 ability to select tools and equipment

1.01.04 ability to operate tools and equipment

1.01.05 ability to maintain tools and equipment

1.01.06 ability to store tools and equipment

Sub-task

1.02 **Uses measuring and testing devices.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.02.01 knowledge of imperial and metric measuring systems

1.02.02	knowledge of types of tools such as gauges, meters and precision tools
1.02.03	knowledge of installation procedures for measuring and testing devices
1.02.04	ability to verify calibration of measuring and testing devices
1.02.05	ability to select measuring and testing devices
1.02.06	ability to use measuring and testing devices
1.02.07	ability to store measuring and testing devices

Sub-task

1.03 Uses hoisting and lifting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.03.01	knowledge of rigging techniques and material
1.03.02	knowledge of rigging equipment
1.03.03	knowledge of capacity and limitations of lifting equipment
1.03.04	knowledge of component weight
1.03.05	knowledge of blocking and cribbing procedures
1.03.06	ability to select rigging equipment
1.03.07	ability to attach rigging equipment to component
1.03.08	ability to operate equipment
1.03.09	ability to use hand signals
1.03.10	ability to block and crib components and equipment
1.03.11	ability to maintain equipment according to manufacturers' specifications

Sub-task

1.04 Uses welding equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	no	yes	yes	yes	yes

1.04.01	knowledge of types of metals
1.04.02	knowledge of government regulations
1.04.03	knowledge of repair limitations of specific components such as Roll-Over Protective Structure (ROPS), Falling Object Protective Structure (FOPS) and pressure vessels
1.04.04	knowledge of basic welding practices (non-structural)
1.04.05	ability to prepare machine or component prior to welding using procedures such as blocking, cribbing and disconnecting batteries
1.04.06	ability to select materials such as welding rods
1.04.07	ability to operate welding equipment (GMAW, GTAW, SMAW)
1.04.08	ability to perform non-structural welding
1.04.09	ability to store welding equipment and materials

Sub-task

1.05 Uses cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.05.01	knowledge of safe handling procedures for cylinders
1.05.02	knowledge of cutting equipment such as gas, plasma and arc/air
1.05.03	knowledge of types of gasses such as acetylene and propane

1.05.04	knowledge of types of metal
1.05.05	ability to set up, operate and shut down cutting equipment
1.05.06	ability to select and adjust gas pressures
1.05.07	ability to maintain cutting equipment such as torch tips and plasma cutters

Sub-task

1.06 Uses heating/cooling equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.06.01	knowledge of types of component heating equipment
1.06.02	knowledge of types of component cooling equipment
1.06.03	knowledge of risks associated with heating equipment
1.06.04	knowledge of types of heating fuels such as propane and acetylene
1.06.05	ability to select accessories
1.06.06	ability to set up heating equipment
1.06.07	ability to set up cooling equipment
1.06.08	ability to maintain heating equipment
1.06.09	ability to maintain cooling equipment
1.06.10	ability to heat components
1.06.11	ability to cool components
1.06.12	ability to store equipment

Sub-task

1.07 Uses cleaning equipment and agents.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

1.07.01	knowledge of types of cleaning equipment
1.07.02	knowledge of types of cleaning agents
1.07.03	knowledge of safe handling, storage and disposal of cleaning agents
1.07.04	knowledge of safe handling, storage and disposal of waste
1.07.05	ability to select and operate cleaning equipment
1.07.06	ability to select agent
1.07.07	ability to maintain cleaning equipment
1.07.08	ability to handle, store and dispose of cleaning agents
1.07.09	ability to handle, store and dispose of waste

Task 2 Performs maintenance and inspections.

Sub-task

2.01 Maintains fuels, lubricants and coolants.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.01.01	knowledge of types of fluids such as engine, drive train and hydraulic
2.01.02	knowledge of fluid ratings such as viscosity and quality

2.01.03	knowledge of handling, storage and disposal procedures and regulations
2.01.04	knowledge of fluids and filter change procedures
2.01.05	knowledge of filter ratings
2.01.06	knowledge of fluid sample analysis
2.01.07	ability to determine service intervals of fluids and filters
2.01.08	ability to perform scheduled fluid sampling
2.01.09	ability to change fluids and filters
2.01.10	ability to select fluids, additives, concentrations and filters
2.01.11	ability to determine compatibility of various fluids
2.01.12	ability to handle, store and dispose of fluids and filters

Sub-task

2.02 Services fasteners, sealing devices, adhesives and gaskets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.02.01	knowledge of imperial and metric measuring systems
2.02.02	knowledge of types of fasteners
2.02.03	knowledge of grades of fasteners
2.02.04	knowledge of torque specifications
2.02.05	knowledge of different tightening methods
2.02.06	knowledge of types of sealing devices such as gaskets, o-rings and packing
2.02.07	knowledge of types of adhesives

2.02.08	knowledge of installation procedures of fasteners, sealing devices and adhesives
2.02.09	ability to select fasteners, sealing devices and adhesives
2.02.10	ability to inspect and repair threads
2.02.11	ability to install fasteners
2.02.12	ability to make gaskets
2.02.13	ability to install sealing devices, gaskets and adhesives

Sub-task

2.03 Services hoses, tubing and fittings.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.03.01	knowledge of types of hoses, tubing and fittings
2.03.02	knowledge of rating and applications of hoses, tubing and fittings
2.03.03	ability to select hoses, fittings and adapters
2.03.04	ability to assemble hoses, tubing and fittings
2.03.05	ability to use crimping tools and dies
2.03.06	ability to use hand and power operated bending equipment

Sub-task

2.04 Services bearings and seals.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.04.01	knowledge of bearing types and materials such as ball, tapered, roller and plain or sleeve

2.04.02	knowledge of seal types such as o-ring, lip, ring, face, static and dynamic
2.04.03	knowledge of seal materials such as neoprene and nitrile
2.04.04	knowledge of removal and installation methods for bearings and seals
2.04.05	ability to diagnose failures of bearings and seals
2.04.06	ability to select tools for removal and installation
2.04.07	ability to remove and install bearings and seals according to manufacturers' specifications
2.04.08	ability to inspect bearings for wear and reusability

Sub-task

2.05 Services safety features. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.05.01	knowledge of types of safety features such as lighting and warning devices, fire suppression systems, lock-out bars and operator access features
2.05.02	knowledge of operation of safety features
2.05.03	knowledge of government regulations such as ROPS and FOPS
2.05.04	knowledge of mechanical lock-out systems
2.05.05	knowledge of audible or visual warning systems/devices
2.05.06	ability to test and verify operation of safety features

2.05.07	ability to arm and disarm fire suppression systems
2.05.08	ability to inspect and report defects of safety features

Sub-task

2.06 Performs scheduled maintenance procedures.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.06.01	knowledge of manufacturers' service recommendations
2.06.02	knowledge of in-house preventative maintenance requirements
2.06.03	knowledge of warranty requirements
2.06.04	ability to interpret maintenance schedules
2.06.05	ability to modify maintenance schedule according to operating environment
2.06.06	ability to service machine according to maintenance schedule

Sub-task

2.07 Performs operational check-out.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.07.01	knowledge of machine operation and controls
2.07.02	knowledge of licensing requirements
2.07.03	knowledge of equipment and component limitations

2.07.04	knowledge of pre-start and walk around inspection
2.07.05	knowledge of parking and shut-down procedures
2.07.06	ability to perform basic operation of machine and components
2.07.07	ability to record and report non-conformities

Sub-task

2.08 Performs return to service check.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

2.08.01	ability to perform a walk around inspection
2.08.02	ability to cycle machine to confirm all systems function to specifications
2.08.03	ability to verify that dimensions/pressures are correct according to specifications
2.08.04	ability to advise operator of follow-up procedures required (i.e. re-torques)

Task 3 Analyses and processes information.

Sub-task

3.01 Diagnoses operational faults.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

3.01.01	knowledge of machine and system operation and limitations
3.01.02	knowledge of diagnostic testing techniques
3.01.03	ability to verify customer/operator complaint

3.01.04	ability to assess operating conditions
3.01.05	ability to cycle machine
3.01.06	ability to apply diagnostic testing techniques
3.01.07	ability to isolate system fault
3.01.08	ability to determine root cause of failure

Sub-task

3.02 Accesses service information. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

3.02.01	knowledge of types of service information
3.02.02	knowledge of technical service bulletins (updates)
3.02.03	knowledge of on-board diagnostic systems
3.02.04	knowledge of schematic types and function
3.02.05	knowledge of factory support
3.02.06	knowledge of data storage and transfer methods
3.02.07	ability to store and transfer electronic data
3.02.08	ability to access and document information using computer software and the Internet
3.02.09	ability to access information using printed matter
3.02.10	ability to follow diagnostic and troubleshooting flow charts
3.02.11	ability to interpret data
3.02.12	ability to interpret drawings and specifications

Sub-task

3.03 Abides by regulations and standards.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

3.03.01	knowledge of government regulations and industry and company standards
3.03.02	knowledge of personal and company liability
3.03.03	ability to access regulations and standards
3.03.04	ability to follow regulations and standards

Sub-task

3.04 Prepares/completes service related documents.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

3.04.01	knowledge of types of service related documents
3.04.02	ability to requisition parts
3.04.03	ability to prepare timesheets
3.04.04	ability to estimate how long a repair will take
3.04.05	ability to provide documentation for work orders
3.04.06	ability to provide documentation for warranties
3.04.07	ability to provide documentation for service records

BLOCK B

ENGINES AND ENGINE SUPPORT SYSTEMS

Trends: *Changes in engine design technologies are being driven by government regulations and increased awareness of environmental concerns.*

Related Sub-Systems: Basic engines, lubrication systems, cooling systems, fuel systems, intake and exhaust systems, engine control system.

Related Components: Fuel systems – fuels, fuel filter, tank, lines, lift pump, mechanical and electronic unit injectors pumps, fuel injector pumps, nozzles, injector tips, hoses, tubes, water separator, governors, timing, spark advance, electronic control module (ECM), sensors, wiring, software.

Lubrication systems – oil pumps, filters, valves, coolers, lubricants, oil lines, bearings, bushings, gears.

Intake and exhaust systems – muffler, tubing, piping, manifold, catalytic converters, scrubber, exhaust gas recirculation components, air cleaner, clamps, blowers, turbochargers, coolers, pre-cleaners.

Cooling systems – water pumps, hoses, clamps, radiators, thermostat, shutters, shrouds, fans, fan drive, regulators, coolant (oil, air and water), heat exchangers.

Engine control system – electronic control modules (ECM) wiring, sensors, linkages, pedals, cables, potentiometer, engine protection devices, retarders.

Basic engine – heads, block, pistons, connecting rods, crankshaft, pins, bearings, cam shaft, gears, lifters, covers, gaskets, seals, push rods, valves, rockers, valve train, flywheel housings, flywheels, bell housing.

Tools and Equipment: Basic hand tools, shop tools, safety equipment, hoisting, rigging and holding equipment, measuring equipment, cleaning equipment.

Task 4 **Diagnoses engines and engine support systems.**

Sub-task

4.01 **Diagnoses engine performance.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.01.01	knowledge of operational test methods such as load, no-load and governed speeds
4.01.02	knowledge of manufacturers' engine ratings
4.01.03	ability to complete sensory inspection
4.01.04	ability to perform and interpret tests such as pressure, temperature and vibration
4.01.05	ability to use diagnostic tools and equipment

Sub-task

4.02 **Diagnoses basic engine.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.02.01	knowledge of engine types and operation
4.02.02	knowledge of engine components
4.02.03	knowledge of engine specifications
4.02.04	knowledge of diagnostic tools
4.02.05	knowledge of diagnostic testing procedures
4.02.06	ability to complete sensory inspection
4.02.07	ability to use diagnostic tools
4.02.08	ability to perform and interpret engine tests

Sub-task

4.03 Diagnoses lubrication systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.03.01	knowledge of lubrication system types and operation
4.03.02	knowledge of lubrication system components
4.03.03	knowledge of lubrication system specifications
4.03.04	knowledge of viscosity and quality of fluids
4.03.05	knowledge of diagnostic tools
4.03.06	knowledge of diagnostic testing procedures
4.03.07	ability to complete sensory inspection
4.03.08	ability to use diagnostic tools
4.03.09	ability to perform and interpret lubrication system tests
4.03.10	ability to perform leak diagnoses (internal or external)

Sub-task

4.04 Diagnoses cooling systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.04.01	knowledge of cooling system types and operation
4.04.02	knowledge of cooling system components
4.04.03	knowledge of cooling system specifications
4.04.04	knowledge of diagnostic tools

4.04.05	knowledge of diagnostic testing procedures
4.04.06	ability to complete sensory inspection
4.04.07	ability to use diagnostic tools
4.04.08	ability to perform and interpret cooling system tests
4.04.09	ability to perform leak diagnoses (internal or external)

Sub-task

4.05 Diagnoses intake and exhaust systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.05.01	knowledge of intake and exhaust system types and operation
4.05.02	knowledge of intake and exhaust system components
4.05.03	knowledge of intake and exhaust systems specifications
4.05.04	knowledge of diagnostic tools
4.05.05	knowledge of diagnostic testing procedures
4.05.06	ability to complete sensory inspection
4.05.07	ability to use diagnostic tools
4.05.08	ability to perform and interpret intake and exhaust system tests

Sub-task

4.06 Diagnoses fuel systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.06.01	knowledge of fuel system types and operation
4.06.02	knowledge of fuel system components
4.06.03	knowledge of fuel system specifications
4.06.04	knowledge of diagnostic tools
4.06.05	knowledge of diagnostic testing procedures
4.06.06	ability to complete sensory inspection
4.06.07	ability to use diagnostic tools
4.06.08	ability to perform and interpret fuel system tests

Sub-task

4.07 Diagnoses engine control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

4.07.01	knowledge of engine control system types and operation
4.07.02	knowledge of engine control system components
4.07.03	knowledge of engine control system specifications
4.07.04	knowledge of diagnostic tools
4.07.05	knowledge of diagnostic testing procedures
4.07.06	ability to complete sensory inspection

4.07.07	ability to use diagnostic tools
4.07.08	ability to perform and interpret engine control system tests

Task 5 Repairs engines and engine support systems.

Sub-task

5.01 Repairs basic engines. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

5.01.01	knowledge of engine components
5.01.02	knowledge of procedures to remove engine and engine components
5.01.03	knowledge of procedures to disassemble engine and engine components
5.01.04	knowledge of procedures to assemble engine and engine components
5.01.05	knowledge of procedures to install engine and engine components
5.01.06	knowledge of manufacturers' specifications
5.01.07	knowledge of start-up procedures
5.01.08	knowledge of break-in procedures
5.01.09	ability to remove engine and engine components
5.01.10	ability to disassemble engine and engine components
5.01.11	ability to determine reusability of engine and engine components
5.01.12	ability to recondition engine and engine components

5.01.13	ability to assemble engine and engine components
5.01.14	ability to install engine and engine components
5.01.15	ability to perform start-up procedures
5.01.16	ability to perform break-in procedures
5.01.17	ability to perform final adjustments

Sub-task

5.02 Repairs lubrication systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

5.02.01	knowledge of lubrication system components
5.02.02	knowledge of procedures to remove lubrication system components
5.02.03	knowledge of procedures to disassemble lubrication system components
5.02.04	knowledge of procedures to assemble lubrication system components
5.02.05	knowledge of procedures to install lubrication system components
5.02.06	knowledge of manufacturers' specifications
5.02.07	knowledge of start-up procedures
5.02.08	ability to remove lubrication system components
5.02.09	ability to disassemble lubrication system components
5.02.10	ability to determine reusability of lubrication system components
5.02.11	ability to recondition lubrication system components

5.02.12	ability to assemble lubrication system components
5.02.13	ability to install lubrication system components
5.02.14	ability to perform start-up procedures
5.02.15	ability to perform final adjustments

Sub-task

5.03 Repairs cooling systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

5.03.01	knowledge of cooling system components
5.03.02	knowledge of procedures to remove cooling system components
5.03.03	knowledge of procedures to disassemble cooling system components
5.03.04	knowledge of procedures to assemble cooling system components
5.03.05	knowledge of procedures to install cooling system components
5.03.06	knowledge of manufacturers' specifications
5.03.07	knowledge of start-up procedures
5.03.08	ability to remove cooling system components
5.03.09	ability to disassemble cooling system components
5.03.10	ability to determine reusability of cooling system components
5.03.11	ability to recondition cooling system components
5.03.12	ability to assemble cooling system components
5.03.13	ability to install cooling system components

5.03.14 ability to perform start-up procedures

5.03.15 ability to perform final adjustments

Sub-task

5.04 Repairs intake and exhaust systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

5.04.01 knowledge of intake and exhaust system components

5.04.02 knowledge of procedures to remove intake and exhaust system components

5.04.03 knowledge of procedures to disassemble intake and exhaust system components

5.04.04 knowledge of procedures to assemble intake and exhaust system components

5.04.05 knowledge of procedures to install intake and exhaust system components

5.04.06 knowledge of manufacturers' specifications

5.04.07 knowledge of start-up procedures

5.04.08 ability to remove intake and exhaust system components

5.04.09 ability to disassemble intake and exhaust system components

5.04.10 ability to determine reusability of intake and exhaust system components

5.04.11 ability to recondition intake and exhaust system components

5.04.12 ability to assemble intake and exhaust system components

5.04.13 ability to install intake and exhaust system components

5.04.14	ability to perform start-up procedures
5.04.15	ability to perform final adjustments

Sub-task

5.05 Repairs fuel systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

5.05.01	knowledge of fuel system components
5.05.02	knowledge of procedures to remove fuel system components
5.05.03	knowledge of procedures to disassemble fuel system components
5.05.04	knowledge of procedures to assemble fuel system components
5.05.05	knowledge of procedures to install fuel system components
5.05.06	knowledge of manufacturers' specifications
5.05.07	knowledge of start-up procedures
5.05.08	ability to remove fuel system components
5.05.09	ability to disassemble fuel system components
5.05.10	ability to determine reusability of fuel system components
5.05.11	ability to recondition fuel system components
5.05.12	ability to assemble fuel system components
5.05.13	ability to install fuel system components
5.05.14	ability to perform start-up procedures
5.05.15	ability to perform final adjustments

Sub-task

5.06 Repairs engine control systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

5.06.01	knowledge of engine control system components
5.06.02	knowledge of procedures to remove engine control system components
5.06.03	knowledge of procedures to disassemble engine control system components
5.06.04	knowledge of procedures to assemble engine control system components
5.06.05	knowledge of procedures to install engine control system components
5.06.06	knowledge of manufacturers' specifications
5.06.07	knowledge of procedures for programming and calibrating controllers
5.06.08	ability to remove engine control system components
5.06.09	ability to disassemble components of engine control systems
5.06.10	ability to determine reusability of engine control system components
5.06.11	ability to recondition engine control system components
5.06.12	ability to assemble engine control system components
5.06.13	ability to install engine control system components
5.06.14	ability to perform final adjustments
5.06.15	ability to program and calibrate controllers

Sub-task

5.07 Verifies repair of engine and engine support systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

5.07.01	knowledge of system specifications
5.07.02	knowledge of expected system performance
5.07.03	ability to perform sensory inspection
5.07.04	ability to use diagnostic tools
5.07.05	ability to determine if additional corrective action is required

BLOCK C

HYDRAULIC AND PNEUMATIC SYSTEMS

Trends: *None identified.*

Related Components: Pumps, lines, tubes, valves, motors, hoses, cylinders, fittings, compressors, oil, compressed air, reservoirs, air dryers, controls, rotary joints, governors.

Tools and Equipment: Basic hand tools, shop tools, safety equipment, hoisting, rigging and holding equipment, measuring equipment, cleaning equipment.

Task 6 **Diagnoses hydraulic and pneumatic systems.**

Sub-task

6.01 **Diagnoses hydraulic systems.** **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

6.01.01	knowledge of hydraulic system types and operation
6.01.02	knowledge of hydraulic system components
6.01.03	knowledge of hydraulic system specifications
6.01.04	knowledge of diagnostic tools
6.01.05	knowledge of diagnostic testing procedures
6.01.06	ability to complete sensory inspection
6.01.07	ability to use diagnostic tools
6.01.08	ability to perform and interpret hydraulic system tests

Sub-task

6.02 Diagnoses hydrostatic systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

6.02.01	knowledge of hydrostatic system types and operation
6.02.02	knowledge of hydrostatic system components
6.02.03	knowledge of hydrostatic system specifications
6.02.04	knowledge of diagnostic tools
6.02.05	knowledge of diagnostic testing procedures
6.02.06	ability to complete sensory inspection
6.02.07	ability to use diagnostic tools
6.02.08	ability to perform and interpret hydrostatic system tests

Sub-task

6.03 Diagnoses pneumatic systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

6.03.01	knowledge of pneumatic system types and operation
6.03.02	knowledge of pneumatic system components
6.03.03	knowledge of pneumatic system specifications
6.03.04	knowledge of diagnostic tools
6.03.05	knowledge of diagnostic testing procedures
6.03.06	ability to complete sensory inspection

6.03.07	ability to use diagnostic tools
6.03.08	ability to perform and interpret pneumatic system tests

Task 7 Repairs hydraulic and pneumatic systems.

Sub-task

7.01 Repairs hydraulic systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

7.01.01	knowledge of hydraulic system components
7.01.02	knowledge of procedures to remove hydraulic system components
7.01.03	knowledge of procedures to disassemble hydraulic system components
7.01.04	knowledge of procedures to assemble hydraulic system components
7.01.05	knowledge of procedures to install hydraulic system components
7.01.06	knowledge of manufacturers' specifications
7.01.07	knowledge of start-up procedures
7.01.08	knowledge of break-in procedures
7.01.09	ability to remove hydraulic system components
7.01.10	ability to disassemble hydraulic system components
7.01.11	ability to determine reusability of hydraulic system components
7.01.12	ability to recondition hydraulic system components

7.01.13	ability to assemble hydraulic system components
7.01.14	ability to install hydraulic system components
7.01.15	ability to perform start-up procedures
7.01.16	ability to perform break-in procedures
7.01.17	ability to perform final adjustments

Sub-task

7.02 Repairs hydrostatic systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	no	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

7.02.01	knowledge of hydrostatic system components
7.02.02	knowledge of procedures to remove hydrostatic system components
7.02.03	knowledge of procedures to disassemble hydrostatic system components
7.02.04	knowledge of procedures to assemble hydrostatic system components
7.02.05	knowledge of procedures to install hydrostatic system components
7.02.06	knowledge of manufacturers' specifications
7.02.07	knowledge of start-up procedures
7.02.08	knowledge of break-in procedures
7.02.09	ability to remove hydrostatic system components
7.02.10	ability to disassemble hydrostatic system components
7.02.11	ability to determine reusability of hydrostatic system components
7.02.12	ability to recondition hydrostatic system components

7.02.13	ability to assemble hydrostatic system components
7.02.14	ability to install hydrostatic system components
7.02.15	ability to perform start-up procedures
7.02.16	ability to perform break-in procedures
7.02.17	ability to perform final adjustments

Sub-task

7.03 Repairs pneumatic systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	no	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

7.03.01	knowledge of pneumatic system components
7.03.02	knowledge of procedures to remove pneumatic system components
7.03.03	knowledge of procedures to disassemble pneumatic system components
7.03.04	knowledge of procedures to assemble pneumatic system components
7.03.05	knowledge of procedures to install pneumatic system components
7.03.06	knowledge of manufacturers' specifications
7.03.07	knowledge of start-up procedures
7.03.08	knowledge of break-in procedures
7.03.09	ability to remove pneumatic system components
7.03.10	ability to disassemble pneumatic system components
7.03.11	ability to determine reusability of pneumatic system components
7.03.12	ability to recondition pneumatic system components

7.03.13	ability to assemble pneumatic system components
7.03.14	ability to install pneumatic system components
7.03.15	ability to perform start-up procedures
7.03.16	ability to perform break-in procedures
7.03.17	ability to perform final adjustments

Sub-task

7.04 Verifies repair of hydraulic, hydrostatic and pneumatic systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

7.04.01	knowledge of system specifications
7.04.02	knowledge of expected system performance
7.04.03	ability to perform sensory inspection
7.04.04	ability to use diagnostic tools
7.04.05	ability to determine if additional corrective action is required

BLOCK D

DRIVE TRAIN

Trends: *None identified.*

Related Components: Bearings, flywheel, clutch, transmission, torque converters, drive shaft, differentials, final drives, transfer case, belts, chains, sprockets, u-joints, axles, component control systems, retarders, traction control devices, fluids, lubricants, couplings, supports, power take-off (PTO).

Tools and Equipment: Basic hand tools, shop tools, safety equipment, hoisting, rigging and holding equipment, measuring equipment, cleaning equipment.

Task 8 **Diagnoses drive trains.**

Sub-task

8.01 **Diagnoses clutch systems.** **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

8.01.01	knowledge of clutch system types and operation
8.01.02	knowledge of clutch system components
8.01.03	knowledge of system specifications
8.01.04	knowledge of diagnostic tools
8.01.05	knowledge of diagnostic testing procedures
8.01.06	ability to complete sensory inspection
8.01.07	ability to use diagnostic tools
8.01.08	ability to perform and interpret clutch system tests

Sub-task

8.02 Diagnoses torque converters, fluid couplers and retarders.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

8.02.01	knowledge of types of torque converters, fluid couplers and retarders and their operation
8.02.02	knowledge of torque converter, fluid coupler and retarder components
8.02.03	knowledge of torque converter, fluid coupler and retarder system specifications
8.02.04	knowledge of diagnostic tools
8.02.05	knowledge of diagnostic testing procedures
8.02.06	ability to complete sensory inspection
8.02.07	ability to use diagnostic tools
8.02.08	ability to perform and interpret torque converter, fluid coupler and retarder tests

Sub-task

8.03 Diagnoses driveline systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

8.03.01	knowledge of driveline system types and operation
8.03.02	knowledge of driveline system components
8.03.03	knowledge of driveline system specifications, including alignment and phasing
8.03.04	knowledge of diagnostic tools
8.03.05	knowledge of diagnostic testing procedures
8.03.06	ability to complete sensory inspection

8.03.07	ability to use diagnostic tools
8.03.08	ability to perform and interpret driveline system tests

Sub-task

8.04 Diagnoses transmission and transfer case systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

8.04.01	knowledge of transmission and transfer case system types and operation
8.04.02	knowledge of transmission and transfer case system components
8.04.03	knowledge of transmission and transfer case system specifications
8.04.04	knowledge of diagnostic tools
8.04.05	knowledge of diagnostic testing procedures
8.04.06	ability to complete sensory inspection
8.04.07	ability to use diagnostic tools
8.04.08	ability to perform and interpret transmission and transfer case system tests

Sub-task

8.05 Diagnoses axle and differential systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

8.05.01	knowledge of axle and differential system types and operation
8.05.02	knowledge of axle and differential system components such as spur gear and planetary gear reduction

8.05.03	knowledge of axle and differential system specifications
8.05.04	knowledge of diagnostic tools
8.05.05	knowledge of diagnostic testing procedures
8.05.06	ability to complete sensory inspection
8.05.07	ability to use diagnostic tools
8.05.08	ability to perform and interpret axle and differential system tests

Sub-task

8.06 Diagnoses final drive systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

8.06.01	knowledge of final drive system types and operation
8.06.02	knowledge of final drive system components
8.06.03	knowledge of final drive system specifications
8.06.04	knowledge of diagnostic tools
8.06.05	knowledge of diagnostic testing procedures
8.06.06	ability to complete sensory inspection
8.06.07	ability to use diagnostic tools
8.06.08	ability to perform and interpret final drive system tests

Task 9 **Repairs drive trains.**

Sub-task

9.01 **Repairs clutch systems.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

9.01.01	knowledge of clutch system components
9.01.02	knowledge of procedures to remove clutch system components
9.01.03	knowledge of procedures to disassemble clutch system components
9.01.04	knowledge of procedures to assemble clutch system components
9.01.05	knowledge of procedures to install clutch system components
9.01.06	knowledge of manufacturers' specifications
9.01.07	knowledge of start-up procedures
9.01.08	knowledge of break-in procedures
9.01.09	ability to remove clutch system components
9.01.10	ability to disassemble clutch system components
9.01.11	ability to determine reusability of clutch system components
9.01.12	ability to recondition clutch system components
9.01.13	ability to assemble clutch system components
9.01.14	ability to install clutch system components
9.01.15	ability to perform start-up procedures
9.01.16	ability to perform break-in procedures
9.01.17	ability to perform final adjustments

Sub-task

9.02 Repairs torque converters, fluid couplers and retarders.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

9.02.01	knowledge of torque converter, fluid coupler and retarder components
9.02.02	knowledge of procedures to remove torque converter, fluid coupler and retarder components
9.02.03	knowledge of procedures to disassemble torque converter, fluid coupler and retarder components
9.02.04	knowledge of procedures to assemble torque converter, fluid coupler and retarder components
9.02.05	knowledge of procedures to install torque converter, fluid coupler and retarder components
9.02.06	knowledge of manufacturers' specifications
9.02.07	knowledge of start-up procedures
9.02.08	ability to remove torque converter, fluid coupler and retarder components
9.02.09	ability to disassemble torque converter, fluid coupler and retarder components
9.02.10	ability to determine reusability of torque converter, fluid coupler and retarder components
9.02.11	ability to recondition torque converter, fluid coupler and retarder components
9.02.12	ability to assemble torque converter, fluid coupler and retarder components
9.02.13	ability to install torque converter, fluid coupler and retarder components

9.02.14	ability to perform start-up procedures
9.02.15	ability to perform final adjustments

Sub-task

9.03 Repairs driveline systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

9.03.01	knowledge of driveline system components
9.03.02	knowledge of procedures to remove driveline system components
9.03.03	knowledge of procedures to disassemble driveline system components
9.03.04	knowledge of procedures to assemble driveline system components
9.03.05	knowledge of procedures to install driveline system components
9.03.06	knowledge of manufacturers' specifications
9.03.07	ability to remove driveline system components
9.03.08	ability to disassemble driveline system components
9.03.09	ability to determine reusability of driveline system components
9.03.10	ability to recondition driveline system components
9.03.11	ability to assemble driveline system components
9.03.12	ability to install driveline system components
9.03.13	ability to perform final adjustments

Sub-task

9.04 Repairs transmission and transfer case systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

9.04.01	knowledge of transmission and transfer case system components
9.04.02	knowledge of procedures to remove transmission and transfer case system components
9.04.03	knowledge of procedures to disassemble transmission and transfer case system components
9.04.04	knowledge of procedures to assemble transmission and transfer case system components
9.04.05	knowledge of procedure to install transmission and transfer case system components
9.04.06	knowledge of manufacturers' specifications
9.04.07	knowledge of start-up procedures
9.04.08	knowledge of break-in procedures
9.04.09	ability to remove transmission and transfer case system components
9.04.10	ability to disassemble transmission and transfer case system components
9.04.11	ability to determine reusability of transmission and transfer case system components
9.04.12	ability to recondition transmission and transfer case system components
9.04.13	ability to assemble transmission and transfer case system components
9.04.14	ability to install transmission and transfer case system components
9.04.15	ability to perform start-up procedures

9.04.16	ability to perform break-in procedures
9.04.17	ability to perform final adjustments

Sub-task

9.05 Repairs axle and differential systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

9.05.01	knowledge of axle and differential system components
9.05.02	knowledge of procedures to remove axle and differential system components
9.05.03	knowledge of procedures to disassemble axle and differential system components
9.05.04	knowledge of procedures to assemble axle and differential system components
9.05.05	knowledge of procedures to install axle and differential system components
9.05.06	knowledge of manufacturers' specifications
9.05.07	ability to remove axle and differential system components
9.05.08	ability to disassemble axle and differential system components
9.05.09	ability to determine reusability of axle and differential system components
9.05.10	ability to recondition axle and differential system components
9.05.11	ability to assemble axle and differential system components
9.05.12	ability to install axle and differential system components
9.05.13	ability to perform final adjustments

Sub-task

9.06 Repairs final drive systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

9.06.01	knowledge of final drive system components
9.06.02	knowledge of procedures to remove final drive system components
9.06.03	knowledge of procedures to disassemble final drive system components
9.06.04	knowledge of procedures to assemble final drive system components
9.06.05	knowledge of procedures to install final drive system components
9.06.06	knowledge of manufacturers' specifications
9.06.07	ability to remove final drive system components
9.06.08	ability to disassemble final drive system components
9.06.09	ability to determine reusability of final drive system components
9.06.10	ability to recondition final drive system components
9.06.11	ability to assemble final drive system components
9.06.12	ability to install final drive system components
9.06.13	ability to perform final adjustments

Sub-task

9.07 Verifies repair of drive train systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

9.07.01	knowledge of system specifications
9.07.02	knowledge of expected system performance
9.07.03	ability to perform sensory inspection
9.07.04	ability to use diagnostic tools
9.07.05	ability to determine if additional corrective action is required

BLOCK E

STEERING, SUSPENSION AND BRAKES

Trends: *None identified.*

Related Components:

Wheel steering systems – tires, wheels, hubs, axles, spindles, king pins, pins, bushings, hydraulic pumps, cylinders, pumps, tie-rods, steering wheel, joystick, pitman arm, drag links, steering shaft, hydraulic motor, wheel bearings, seals, fluids and lubricants, hoses and fittings, steering box, mounting hardware, control valves, electrical/electronic controls.

Track steering systems – control levers, linkages, control valves, steering clutches, steering brakes, hydraulic pump, hydraulic motor, lines, fluids and lubricants, final drive, sprockets, tracks, rollers, idlers, pads, track frame.

Suspension systems – spring hangers, springs, axle assemblies, pins, bushings, walking beams, wheels, tires, torque rods, rubber blocks, air bags, air valves, shocks, struts, valves, accumulators, cylinders, fluids and lubricants, bolts, rivets.

Wet/dry braking systems – lines, hoses, booster, accumulators, valves, air supply system, air control system, brake actuator and linkage, drums, rotors, discs, plates, shafts, wheels, tires, brake bands, anti-lock systems.

Wheel assemblies – tires, rims, wheels, mounting hardware, valve stems, seals.

Undercarriage – tracks, frame, rollers, idlers, sprockets, pins, bushings, mounting hardware, adjusting mechanism, equalizer bar, pivot shaft, recoil spring, related fasteners.

Tools and Equipment: Basic hand tools, shop tools, safety equipment, hoisting, rigging and holding equipment, measuring equipment, cleaning equipment.

Task 10 Diagnoses steering, suspension and brake systems.

Sub-task

10.01 Diagnoses steering systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

10.01.01 knowledge of steering system types and operation

10.01.02	knowledge of steering system components
10.01.03	knowledge of steering system specifications
10.01.04	knowledge of diagnostic tools
10.01.05	knowledge of diagnostic testing procedures
10.01.06	ability to complete sensory inspection
10.01.07	ability to use diagnostic tools
10.01.08	ability to perform and interpret steering system tests

Sub-task

10.02 Diagnoses suspension systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

10.02.01	knowledge of suspension system types and operation
10.02.02	knowledge of suspension system components
10.02.03	knowledge of suspension system specifications
10.02.04	knowledge of diagnostic tools
10.02.05	knowledge of diagnostic testing procedures
10.02.06	ability to complete sensory inspection
10.02.07	ability to use diagnostic tools
10.02.08	ability to perform and interpret suspension system tests

Sub-task

10.03 Diagnoses braking systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

10.03.01	knowledge of braking system types and operation
10.03.02	knowledge of braking system components
10.03.03	knowledge of braking system specifications
10.03.04	knowledge of diagnostic tools
10.03.05	knowledge of diagnostic testing procedures
10.03.06	ability to complete sensory inspection
10.03.07	ability to use diagnostic tools
10.03.08	ability to perform and interpret braking system tests
10.03.09	ability to check adjustments

Sub-task

10.04 Diagnoses wheel assemblies. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

10.04.01	knowledge of wheel construction and types
10.04.02	knowledge of wear limits
10.04.03	knowledge of tire construction
10.04.04	knowledge of the effects of related systems on wheel assemblies such as steering, suspension and braking systems
10.04.05	knowledge of types and applications of tire chains

10.04.06	knowledge of wheel assembly removal procedures
10.04.07	knowledge of manufacturers' specifications
10.04.08	ability to remove wheel assemblies
10.04.09	ability to inspect mounting hardware and wheel assemblies for cuts, pressure and cracks

Sub-task

10.05 Diagnoses undercarriage systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

10.05.01	knowledge of undercarriage system types and operation
10.05.02	knowledge of undercarriage system components
10.05.03	knowledge of undercarriage system specifications
10.05.04	knowledge of diagnostic tools
10.05.05	knowledge of diagnostic testing procedures
10.05.06	ability to complete sensory inspection
10.05.07	ability to use diagnostic tools
10.05.08	ability to perform and interpret undercarriage system tests

Task 11 Repairs steering, suspension and brake systems.

Sub-task

11.01 Repairs steering systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

11.01.01	knowledge of steering system components
11.01.02	knowledge of procedures to remove steering system components
11.01.03	knowledge of procedures to disassemble steering system components
11.01.04	knowledge of procedures to assemble steering system components
11.01.05	knowledge of procedures to install steering system components
11.01.06	knowledge of manufacturers' specifications
11.01.07	knowledge of start-up procedures
11.01.08	ability to remove steering system components
11.01.09	ability to disassemble steering system components
11.01.10	ability to determine reusability of steering system components
11.01.11	ability to recondition steering system components
11.01.12	ability to assemble steering system components
11.01.13	ability to install steering system components
11.01.14	ability to perform start-up procedures
11.01.15	ability to perform final adjustments

Sub-task

11.02 Repairs suspension systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

11.02.01	knowledge of suspension system components
11.02.02	knowledge of procedures to remove suspension system components
11.02.03	knowledge of procedures to disassemble suspension system components
11.02.04	knowledge of procedures to assemble suspension system components
11.02.05	knowledge of procedures to install suspension system components
11.02.06	knowledge of manufacturers' specifications
11.02.07	ability to remove suspension system components
11.02.08	ability to disassemble suspension system components
11.02.09	ability to determine reusability of suspension system components
11.02.10	ability to recondition suspension system components
11.02.11	ability to assemble suspension system components
11.02.12	ability to install suspension system components
11.02.13	ability to perform final adjustments

Sub-task

11.03 Repairs braking systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

11.03.01	knowledge of braking system components
11.03.02	knowledge of procedures to remove braking system components
11.03.03	knowledge of procedures to disassemble braking system components
11.03.04	knowledge of procedures to assemble braking system components
11.03.05	knowledge of procedures to install braking system components
11.03.06	knowledge of manufacturers' specifications
11.03.07	knowledge of start-up procedures
11.03.08	knowledge of break-in procedures
11.03.09	ability to remove braking system components
11.03.10	ability to disassemble braking system components
11.03.11	ability to determine reusability of braking system components
11.03.12	ability to recondition braking system components
11.03.13	ability to assemble braking system components
11.03.14	ability to install braking system components
11.03.15	ability to perform start-up procedures
11.03.16	ability to perform break-in procedures
11.03.17	ability to perform final adjustments

Sub-task

11.04 Repairs wheel assemblies.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

11.04.01	knowledge of wheel assembly components
11.04.02	knowledge of procedures to remove wheel assembly components
11.04.03	knowledge of procedures to disassemble wheel assembly components
11.04.04	knowledge of procedures to assemble wheel assembly components
11.04.05	knowledge of procedures to install wheel assembly components
11.04.06	knowledge of manufacturers' specifications
11.04.07	ability to remove wheel assembly components
11.04.08	ability to disassemble wheel assembly components
11.04.09	ability to determine reusability of wheel assembly components
11.04.10	ability to recondition wheel assembly components
11.04.11	ability to assemble wheel assembly components
11.04.12	ability to install wheel assembly components
11.04.13	ability to perform final adjustments

Sub-task

11.05 Repairs undercarriage systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

11.05.01	knowledge of undercarriage system components
11.05.02	knowledge of procedures to remove undercarriage system components
11.05.03	knowledge of procedures to disassemble undercarriage system components
11.05.04	knowledge of procedures to assemble undercarriage system components
11.05.05	knowledge of procedures to install undercarriage system components
11.05.06	knowledge of manufacturers' specifications
11.05.07	knowledge of break-in procedures
11.05.08	ability to remove undercarriage system components
11.05.09	ability to disassemble undercarriage system components
11.05.10	ability to determine reusability of undercarriage system components
11.05.11	ability to recondition undercarriage system components
11.05.12	ability to assemble undercarriage system components
11.05.13	ability to install undercarriage system components
11.05.14	ability to perform break-in procedures
11.05.15	ability to perform final adjustments

Sub-task

11.06 Verifies repair of steering, suspension and braking systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

11.06.01	knowledge of system specifications
11.06.02	knowledge of expected system performance
11.06.03	ability to perform sensory inspection
11.06.04	ability to use diagnostic tools
11.06.05	ability to determine if additional corrective action is required

BLOCK F

ELECTRICAL AND ELECTRONIC SYSTEMS

Trends: *None identified.*

Related Electrical Sub-Systems:	Battery, starting, charging, power distribution, circuit breakers monitoring, lighting, accessories
Related Electronic Sub-Systems:	Monitoring systems, electronic control modules, data storage, machine locating systems, machine security systems.
Related Components:	Electrical – battery, alternator, starter, cables, wires, lights, wire harness, gauges, solenoids, relays, fuses, fuse panel, buzzers, alarms, senders, coils, fluids. Electronic – battery, alternator, starter, cables, wires, lights, wire harness, gauges, solenoids, relays, fuses, fuse panel, buzzers, alarms, electronic control modules, senders, electronic injectors, coils, fluids, electronic control valves, speed sensors, temperature sensors, pressure sensors, position sensor, software.
Tools and Equipment:	Basic hand tools, shop tools, safety equipment, holding equipment, measuring equipment, cleaning equipment.

Task 12 **Diagnoses electrical and electronic systems.**

Sub-task

12.01 **Diagnoses electrical systems.** **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

12.01.01	knowledge of electrical system types and operation
12.01.02	knowledge of electrical system components
12.01.03	knowledge of electrical system specifications
12.01.04	knowledge of diagnostic tools
12.01.05	knowledge of diagnostic testing procedures
12.01.06	ability to complete sensory inspection

12.01.07	ability to use diagnostic tools
12.01.08	ability to perform and interpret electrical system tests

Sub-task

12.02 Diagnoses electronic systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

12.02.01	knowledge of electronic system types and operation
12.02.02	knowledge of electronic system components
12.02.03	knowledge of electronic system specifications
12.02.04	knowledge of diagnostic tools
12.02.05	knowledge of diagnostic testing procedures
12.02.06	ability to complete sensory inspection
12.02.07	ability to use diagnostic tools
12.02.08	ability to perform and interpret electronic system tests

Task 13 Repairs electrical and electronic systems.

Sub-task

13.01 Repairs electrical systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

13.01.01	knowledge of electrical system components
13.01.02	knowledge of procedures to remove electrical system components

13.01.03	knowledge of procedures to disassemble electrical system components
13.01.04	knowledge of wire harness repair procedures
13.01.05	knowledge of procedures to assemble electrical system components
13.01.06	knowledge of procedures to install electrical system components
13.01.07	knowledge of manufacturers' specifications
13.01.08	ability to remove electrical system components
13.01.09	ability to disassemble electrical system components
13.01.10	ability to determine reusability of electrical system components
13.01.11	ability to recondition electrical system components
13.01.12	ability to repair wire harnesses
13.01.13	ability to assemble electrical system components
13.01.14	ability to install electrical system components
13.01.15	ability to perform final adjustments

Sub-task

13.02 Repairs electronic systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	no	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

13.02.01	knowledge of electronic system components
13.02.02	knowledge of manufacturers' specifications
13.02.03	knowledge of static discharge procedures
13.02.04	knowledge of procedures to remove electronic system components

13.02.05	knowledge of procedures to replace electronic system components
13.02.06	knowledge of wire harness repair procedures
13.02.07	knowledge of electronic component programming procedures
13.02.08	knowledge of calibration procedures
13.02.09	ability to perform static discharge procedures
13.02.10	ability to remove electronic system components
13.02.11	ability to install/replace electronic system components
13.02.12	ability to repair wire harnesses
13.02.13	ability to retrieve data from failed components
13.02.14	ability to program new electronic system components for intended use
13.02.15	ability to perform calibration/adjustment procedures

Sub-task

13.03 Verifies repair of electrical and electronic systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

13.03.01	knowledge of system specifications
13.03.02	knowledge of expected system performance
13.03.03	ability to determine if additional corrective action is required
13.03.04	ability to clear service codes
13.03.05	ability to perform sensory inspection
13.03.06	ability to use diagnostic tools

BLOCK G

STRUCTURAL COMPONENTS, CLIMATE CONTROL, ACCESSORIES AND ATTACHMENTS

Trends: *There is an increased use of safety features as well as operator comfort features. There is also an increased use of electronics such as Global Positioning System (GPS), data recording and controls. Requirements for additional specialized licensing such as ozone depleting substances are increasing.*

Related Components: Auto control systems (HVAC) – A/C compressor, hoses/fittings, condensers/evaporators, heater core, receiver/dryer, accumulator, controls, sensor, control valves, coolant/refrigeration fluids, fans/motors, vents.

Structural components – frames, ROPS/FOPS, guards, covers and belly pans, boom, sticks and loader arms, platform, stairs, rails, swing and articulation bearings.

Operator station – switches, handles, levers, pedals, gauges, power controls, padded walls/insulation/sound proofing, emergency exit system, sun visors, steering, seat, seat belt, bulbs, glass, wiper, windshield washer, door, radio, mirrors, GPS.

Attachments and accessories – manufacturers' or after-market attachments (buckets, hammer, forks, tree harvesters, clams and grapples), mounting hardware, hydraulic components (hoses, fittings, couplers, actuators, valves, electrical and electronic controls), ground engaging tools, manufacturers' or after-market accessories (auto greaser, light, anti-vandalism equipment, cold weather package, railings, platforms).

Tools and Equipment: Basic hand tools, shop tools, safety equipment, hoisting, rigging and holding equipment, measuring equipment, cleaning equipment.

Task 14 **Diagnoses and repairs HVAC systems.**

Sub-task

14.01 **Diagnoses heating systems.** **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.01.01 knowledge of heating system types and operation

14.01.02 knowledge of heating system components

14.01.03	knowledge of heating system specifications
14.01.04	knowledge of diagnostic tools
14.01.05	knowledge of diagnostic testing procedures
14.01.06	ability to complete sensory inspection
14.01.07	ability to use diagnostic tools
14.01.08	ability to perform and interpret heating system tests

Sub-task

14.02 Repairs heating systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.02.01	knowledge of heating system components
14.02.02	knowledge of procedures to remove heating system components
14.02.03	knowledge of procedures to disassemble heating system components
14.02.04	knowledge of procedures to assemble heating system components
14.02.05	knowledge of procedures to install heating system components
14.02.06	knowledge of manufacturers' specifications
14.02.07	knowledge of start-up procedures
14.02.08	ability to remove heating system components
14.02.09	ability to disassemble heating system components
14.02.10	ability to determine reusability of heating system components
14.02.11	ability to recondition heating system components

14.02.12	ability to assemble heating system components
14.02.13	ability to install heating system components
14.02.14	ability to perform start-up procedures
14.02.15	ability to perform final adjustments

Sub-task

14.03 Verifies repair of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.03.01	knowledge of system specifications
14.03.02	knowledge of expected system performance
14.03.03	ability to perform sensory inspection
14.03.04	ability to use diagnostic tools
14.03.05	ability to determine if additional corrective action is required

Sub-task

14.04 Diagnoses ventilation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.04.01	knowledge of ventilation system types and operation
14.04.02	knowledge of ventilation system components
14.04.03	knowledge of ventilation system specifications
14.04.04	knowledge of diagnostic tools
14.04.05	knowledge of diagnostic testing procedures

14.04.06	ability to complete sensory inspection
14.04.07	ability to use diagnostic tools
14.04.08	ability to perform and interpret ventilation system tests

Sub-task

14.05 Repairs ventilation systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.05.01	knowledge of ventilation system components
14.05.02	knowledge of procedures to remove ventilation system components
14.05.03	knowledge of procedures to disassemble ventilation system components
14.05.04	knowledge of procedures to assemble ventilation system components
14.05.05	knowledge of procedures to install ventilation system components
14.05.06	knowledge of manufacturers' specifications
14.05.07	knowledge of break-in procedures
14.05.08	ability to remove ventilation system components
14.05.09	ability to disassemble ventilation system components
14.05.10	ability to determine reusability of ventilation system components
14.05.11	ability to recondition ventilation system components
14.05.12	ability to assemble ventilation system components
14.05.13	ability to install ventilation system components

14.05.14	ability to perform break-in procedures
14.05.15	ability to perform final adjustments

Sub-task

14.06 Verifies repair of ventilation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

14.06.01	knowledge of system specifications
14.06.02	knowledge of expected system performance
14.06.03	ability to perform sensory inspection
14.06.04	ability to use diagnostic tools
14.06.05	ability to determine if additional corrective action is required

Sub-task

14.07 Diagnoses air conditioning systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	no	yes	yes	no	yes	yes	yes	yes

14.07.01	knowledge of air conditioning system types and operation
14.07.02	knowledge of air conditioning system components
14.07.03	knowledge of air conditioning system specifications
14.07.04	knowledge of diagnostic tools
14.07.05	knowledge of diagnostic testing procedures
14.07.06	ability to complete sensory inspection

14.07.07	ability to use diagnostic tools
14.07.08	ability to perform and interpret air conditioning system tests

Sub-task

14.08 Repairs air conditioning systems.

Supporting Knowledge & Abilities

(NOT COMMON CORE)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	no	yes	yes	no	yes	yes	no	yes

14.08.01	knowledge of government regulations (ODS – ozone depleting substances)
14.08.02	knowledge of air conditioning system components
14.08.03	knowledge of procedures to remove air conditioning system components
14.08.04	knowledge of procedures to disassemble air conditioning system components
14.08.05	knowledge of procedures to assemble air conditioning system components
14.08.06	knowledge of procedures to install air conditioning system components
14.08.07	knowledge of manufacturers' specifications
14.08.08	knowledge of break-in procedures
14.08.09	ability to remove air conditioning system components
14.08.10	ability to disassemble air conditioning system components
14.08.11	ability to determine reusability of air conditioning system components
14.08.12	ability to recondition air conditioning system components

14.08.13	ability to assemble air conditioning system components
14.08.14	ability to install air conditioning system components
14.08.15	ability to perform break-in procedures
14.08.16	ability to perform final adjustments

Sub-task

14.09 Verifies repair of air conditioning systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	no	yes	yes	NV	no	yes	yes	no	yes	yes	yes	yes

14.09.01	knowledge of system specifications
14.09.02	knowledge of expected system performance
14.09.03	ability to perform sensory inspection
14.09.04	ability to use diagnostic tools
14.09.05	ability to determine if additional corrective action is required

Task 15 Services structural components.

Sub-task

15.01 Diagnoses structural components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

15.01.01	knowledge of manufacturers' specifications
15.01.02	knowledge of structural component construction
15.01.03	knowledge of government regulations

15.01.04	knowledge of defect detection methods
15.01.05	ability to follow manufacturers' procedures
15.01.06	ability to follow government regulations
15.01.07	ability to check for defects

Sub-task

15.02 Performs mechanical repairs on structural components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

15.02.01	knowledge of structural components
15.02.02	knowledge of procedures to remove structural components
15.02.03	knowledge of procedures to disassemble structural components
15.02.04	knowledge of procedures to assemble structural components
15.02.05	knowledge of procedures to install structural components
15.02.06	knowledge of manufacturers' specifications
15.02.07	ability to remove structural components
15.02.08	ability to disassemble structural components
15.02.09	ability to determine reusability of structural components
15.02.10	ability to recondition structural components
15.02.11	ability to assemble structural components
15.02.12	ability to install structural components
15.02.13	ability to perform final adjustments

Sub-task

15.03 Verifies mechanical repair of structural components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

15.03.01	knowledge of component specifications
15.03.02	knowledge of expected component performance
15.03.03	ability to perform sensory inspection
15.03.04	ability to use diagnostic tools
15.03.05	ability to determine if additional corrective action is required

Task 16 Services operator station.

Sub-task

16.01 Diagnoses operator station components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

16.01.01	knowledge of operator station types and operation
16.01.02	knowledge of operator station components
16.01.03	knowledge of operator station and component specifications
16.01.04	knowledge of company regulations and manufacturers' specifications
16.01.05	knowledge of diagnostic tools
16.01.06	knowledge of diagnostic testing procedures
16.01.07	ability to complete sensory inspection

16.01.08	ability to use diagnostic tools
16.01.09	ability to perform and interpret operator station component tests

Sub-task

16.02 Repairs operator station components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

16.02.01	knowledge of operator station components
16.02.02	knowledge of procedures to remove operator station components
16.02.03	knowledge of procedures to disassemble operator station components
16.02.04	knowledge of procedures to assemble operator station components
16.02.05	knowledge of procedures to install operator station components
16.02.06	knowledge of manufacturers' specifications
16.02.07	ability to remove operator station components
16.02.08	ability to disassemble operator station components
16.02.09	ability to determine reusability of operator station components
16.02.10	ability to recondition operator station components
16.02.11	ability to assemble operator station components
16.02.12	ability to install operator station components
16.02.13	ability to perform final adjustments

Sub-task

16.03 Verifies repair of operator station components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

16.03.01	knowledge of operator station specifications
16.03.02	knowledge of expected operator station performance
16.03.03	ability to perform sensory inspection
16.03.04	ability to use diagnostic tools
16.03.05	ability to determine if additional corrective action is required

Task 17 Installs, diagnoses and repairs attachments and accessories.

Sub-task

17.01 Installs attachments.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.01.01	knowledge of manufacturers' specifications and procedures
17.01.02	knowledge of company standards
17.01.03	knowledge of modification techniques required to integrate attachment
17.01.04	ability to follow manufacturers' specifications
17.01.05	ability to integrate attachment

Sub-task

17.02 Diagnoses attachments.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.02.01	knowledge of attachment types and intended operation
17.02.02	knowledge of method of operation
17.02.03	knowledge of attachment components
17.02.04	knowledge of attachment specifications
17.02.05	knowledge of diagnostic tools
17.02.06	knowledge of diagnostic testing procedures
17.02.07	ability to complete sensory inspection
17.02.08	ability to use diagnostic tools
17.02.09	ability to operate attachment
17.02.10	ability to perform and interpret attachment tests

Sub-task

17.03 Repairs attachments.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.03.01	knowledge of attachment components
17.03.02	knowledge of procedures to remove attachment components
17.03.03	knowledge of machine systems related to attachments
17.03.04	knowledge of procedures to disassemble attachment components

17.03.05	knowledge of procedures to assemble attachment components
17.03.06	knowledge of procedures to install attachment components
17.03.07	knowledge of manufacturers' specifications
17.03.08	knowledge of company standards
17.03.09	knowledge of start-up procedures
17.03.10	knowledge of break-in procedures
17.03.11	ability to remove attachment components
17.03.12	ability to disassemble attachment components
17.03.13	ability to determine reusability of attachment components
17.03.14	ability to recondition attachment components
17.03.15	ability to assemble attachment components
17.03.16	ability to install attachment components
17.03.17	ability to perform start-up procedures
17.03.18	ability to perform break-in procedures
17.03.19	ability to perform final adjustments

Sub-task

17.04 Verifies repair of attachments.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.04.01	knowledge of attachment specifications
17.04.02	knowledge of expected attachment performance
17.04.03	ability to perform sensory inspection

17.04.04	ability to use diagnostic tools
17.04.05	ability to determine if additional corrective action is required

Sub-task

17.05 Installs accessories.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.05.01	knowledge of manufacturers' specifications and procedures
17.05.02	knowledge of company standards
17.05.03	knowledge of modification techniques required to integrate accessories
17.05.04	ability to follow manufacturers' specifications
17.05.05	ability to integrate accessories

Sub-task

17.06 Diagnoses accessories.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.06.01	knowledge of accessory types and intended operation
17.06.02	knowledge of method of operation
17.06.03	knowledge of accessory components
17.06.04	knowledge of accessory specifications
17.06.05	knowledge of diagnostic tools
17.06.06	knowledge of diagnostic testing procedures
17.06.07	ability to complete sensory inspection

17.06.08	ability to use diagnostic tools
17.06.09	ability to operate accessories
17.06.10	ability to perform and interpret accessory tests

Sub-task

17.07 Repairs accessories.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.07.01	knowledge of accessory components
17.07.02	knowledge of procedures to remove accessory components
17.07.03	knowledge of machine systems related to accessories
17.07.04	knowledge of procedures to disassemble accessory components
17.07.05	knowledge of procedures to assemble accessory components
17.07.06	knowledge of procedures to install accessory components
17.07.07	knowledge of manufacturers' specifications
17.07.08	knowledge of start-up procedures
17.07.09	knowledge of break-in procedures
17.07.10	ability to remove accessory components
17.07.11	ability to disassemble accessory components
17.07.12	ability to determine reusability of accessory components
17.07.13	ability to recondition accessory components
17.07.14	ability to assemble accessory components
17.07.15	ability to install accessory components
17.07.16	ability to perform start-up procedures

17.07.17	ability to perform break-in procedures
17.07.18	ability to perform final adjustments

Sub-task

17.08 Verifies repair of accessories. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	yes	yes	yes	yes	yes	yes	yes

17.08.01	knowledge of accessory specifications
17.08.02	knowledge of expected accessory performance
17.08.03	ability to perform sensory inspection
17.08.04	ability to use diagnostic tools
17.08.05	ability to determine if additional corrective action is required

APPENDICES

TOOLS AND EQUIPMENT

Basic Hand Tools

½, ¼, ¾ and $^{3}/_{8}$ inch drive socket sets
adjustable wrenches
battery post and clamp cleaner, battery terminal nut
brass drift
center punch
chisels
convertible $^{2}/_{3}$ jaw puller
cutting equipment: side cutter, tube cutter, wire cutter, plier cutters, shears
digital multimeter
feeler gauge set, metric and imperial
steel rule
H puller
hacksaw
half round file
hammers: impact, rubber, sledge, air, slide
hex key set, metric and imperial
jumper wires
magnetic pick-up tool, telescopic, flex
micrometer
pin punches
pipe wrench
pliers, battery terminal nut
pliers: insulator, snap ring, torque, multipliers
pry/aligning bar
punches
round file
scraper
screwdriver
sockets
tape measure
test light
tool chest
torque wrench
torx bits
universal joint
utility knife
vernier calliper
wire brush
wire crimper and stripper
wrench set, combination, metric & imperial
wrench set, flare nut, metric & imperial

Shop Tools

¾ – 1 inch power bars/torque wrenches
air compressor
air line adapters
alignment tool
analyzers: four-gas, gas, infra-red gas, vibration meter
battery charger
battery load/starting system tester
bearing heater
black light
bleeding equipment
booster cables
brake lathe
break out box
butane torch
calibrated vessel
callipers: outside, inside
carburetor tools
chemical agitator
chisels: air, electric, hand
clutch alignment tool
component heating or cooling equipment
compressors: air, mechanical spring, piston ring, pneumatic spring, spring, valve spring
computer equipment: terminals, on-board computer, portable diagnostic computer, printer
connecting rod aligner
containers
continuity tester

coolant recycling unit
cooling system/pressure tester
crack detecting equipment
crimping tools
cutting and welding torch set
cylinder cart/kit/tank
diagnostic equipment
drift
drills: bench, hand drivers, twist, air
exhaust expanders
extension cord/trouble light
fast charger
files
flaring tool
fluid containers
flushing kit
fuel quality test kit
fuel recovery and storage system
funnels
grease gun
grinders: bench, hand, valve
hand pump
harness tester
honing equipment
hot air gun
labelling kit
leak detection equipment
leakdown tester
level protractor
magnaflux equipment
module tester
nitrogen charging equipment
overhaul tools
presses: arbor, swing, hydraulic, bushing, shop, mechanical, hand
pry bars
pullers: bearing, gear, heavy duty, mechanical, torque ratchet
reamers
recycling unit
refractometer
replacement tools
retrieval and storage equipment
ridge reamer
sandblaster
sanders
saws: jigsaw, hacksaw, hole saw
scanning tools
seal driver
shims
shop vacuum
soldering iron/gun
spacers
spark lighter
splicing clips
steering tools
straight edge
strobe light/tachometer
stud extractor
suction cups
tap and die sets
temperature reader
thermostat tester
thread file
thread inserts
tire bar
tire depth indicator
tire machine
torque angle tool, torque wrench
torque multiplier
tube bender
vacuum pump
valve and seat grinding equipment
valve guide service kit
valve lapping block
valve spring tester
vapour degreaser
vices
welding equipment

Safety Equipment

apron
communication devices
CPR accessories (disposable)
ear protection
emergency backup lighting
eye wash station
face shield
fall arrest equipment
fire extinguishers
fireproof blanket
first aid station
gas mask
gloves
goggles
hand shields
ladders
leather gloves
leggings
manlift
Material Safety Data Sheets (MSDS)
respirators
safety boots
safety cage
safety glasses
safety hats
splash suit
sprinkler systems
stretcher

Cleaning Equipment

air blowguns
brake cleaning equipment
caustic cleaning tank
cleaning cloth
cleaning gloves
crocus cloth
glass bead machine
hot tank degreaser
parts cleaning solvent
pressure washer
soft brush
solvent washer
steam cleaner
wire brush

Hoisting, Rigging and Holding Equipment

axle stand
bottle/axle jack
cable hoist
chain hoist
clamps
clevises
dolly
engine crane
engine repair stand
floor crane
floor hoist
ground strap
hydraulic floor jack
hydraulic guards
hydraulic hand jack/porta-power
portable engine crane
repair stand
shims/blocking
single post hoist
slings/cables/chains
spreader bars
support stand
tire guards
transmission jack
vices

Measuring Tools, Gauges and Equipment

air gauge
ammeter
belt tension gauge
boost gauge
boroscope
compression gauge
cylinder bore gauge
depth micrometer
dial gauge
electric pressure gauge
flowmeter
fuel pressure gauge
holding gauge
hydraulic pressure testing gauges/fittings
hydrometer
inside micrometer
levels
manifold gauge
measuring rods
mechanical pressure gauge
meter stick
non-magnetic feeler gauge
oil temperature gauge
pinion angle gauge
plasti-gauge
pressure gauge
pull-type scale
pyrometer
small hole gauge
spectroscope
spring scale
steel rules
stethoscope
straightedge
suspension measuring device
tachometer
telescoping gauge
test leads
test light
thermometer
timing gauge
timing light
tire gauge
torquemeter
transmission gauge set
vacuum gauge
vibration analyzer

GLOSSARY

accessories	non-essential components added to the machine to enhance the operation or extend machine longevity; for example: greasing systems, radio, air conditioning and extra lights. Although some accessories are non-essential to the machine operation, they are sometimes required in extreme operating environments.
attachments	components added to the machine that are integral to its operation to perform a specific job; for example: ripper, winch, thumb, hammer, tamper or forks.
basic engine	assembled block and head including internal components and gear trains.
break-in	a controlled operation specified by the manufacturer on new or repaired components to maximize service life.
cold weather package	accessories used to aid machine start-up and operation in cold weather environments; may include fluid heaters, extra batteries, glow plug systems, ether injection systems, heating pads and inlet air heaters.
driveline	the drive connection between a power source and a driven component.
drive train	the mechanical portion of the driveline from the flywheel to the tires or the track excluding hydrostatic systems.
electrical systems	starting, charging, lighting and accessory circuits without computer control modules.
electronic systems	electrical systems operated via computerized electronic control modules and related sensors and wiring.
FOPS	Falling Object Protective Structure.
hydrostatic system	a hydraulic system which uses fluid under pressure to transmit power through tubes or hoses to machine drive components such as wheel or track drives.
operator station	interface between the operator and the equipment's other systems that enables operation and monitoring of the machine.
overhaul	rebuild or repair to like new condition.
powertrain	includes the drive train plus the engine (including hydrostatic systems).

ROPS	Roll-Over Protective Structure.
sensory inspection	diagnosing or inspecting using sight, sound, smell and feel.
start-up	a specific procedure to begin operation of a machine or system.
structural components	components that make up the integral structure of the machine; for example: frame, lift arms, booms, sticks, loader frames, counterweights, ROPS and FOPS.
suspension	components that support the main frame from the ground and may include undercarriage, axle and wheel assemblies.
undercarriage	track type components required to support the machine and transmit power from the final drive to the ground.
wheel assembly	wheel or rim assembly, tire and attaching hardware.

BLOCKS AND TASKS WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	11	10	10	11	NV	5	8	9	15	9	20	5	10	10%

Task 1 Uses tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	26	25	20	32	NV	33	50	33	50	10	30	35	50	33%

Task 2 Performs maintenance and inspections.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	42	25	40	32	NV	35	30	33	30	30	40	40	30	34%

Task 3 Analyses and processes information.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	32	50	40	36	NV	32	20	34	20	60	30	25	20	33%

BLOCK B ENGINE AND ENGINE SUPPORT SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	14	16	25	17	NV	18	23	15	14	15	15	17	20	18%

Task 4 Diagnoses engines and engine support systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	58	65	40	60	NV	60	40	60	60	50	40	70	60	55%

Task 5 Repairs engines and engine support systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	42	35	60	40	NV	40	60	40	40	50	60	30	40	45%

BLOCK C HYDRAULIC AND PNEUMATIC SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	15	20	15	20	NV	18	15	18	20	20	10	18	10	17%

Task 6 Diagnoses hydraulic and pneumatic systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	59	60	60	62	NV	62	60	55	65	70	35	70	60	60%

Task 7 Repairs hydraulic and pneumatic systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	41	40	40	38	NV	38	40	45	35	30	65	30	40	40%

BLOCK D DRIVE TRAIN

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	13	14	15	12	NV	13	18	16	10	15	15	20	20	15%

Task 8 Diagnoses drive trains.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	59	50	40	58	NV	60	30	49	30	40	40	65	60	48%

Task 9 Repairs drive trains.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	41	50	60	42	NV	40	70	51	70	60	60	35	40	52%

BLOCK E STEERING, SUSPENSION AND BRAKES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	18	12	10	13	NV	12	12	11	14	15	10	17	10	13%

Task 10 Diagnoses steering, suspension and brake systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	61	60	60	56	NV	52	30	48	30	50	35	60	60	50%

Task 11 Repairs steering, suspension and brake systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	39	40	40	44	NV	48	70	52	70	50	65	40	40

50%

BLOCK F ELECTRICAL AND ELECTRONIC SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	17	20	15	19	NV	24	19	22	22	20	20	15	20	19%

Task 12 Diagnoses electrical and electronic systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	60	70	60	65	NV	68	75	72	80	70	80	70	70

70%

Task 13 Repairs electrical and electronic systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	40	30	40	35	NV	32	25	28	20	30	20	30	30

30%

BLOCK G STRUCTURAL COMPONENTS, CLIMATE CONTROL, ACCESSORIES AND ATTACHMENTS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	12	8	10	8	NV	10	5	9	5	6	10	8	10	8%

Task 14 Diagnoses and repairs HVAC systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	30	10	25	33	NV	23	75	38	10	20	40	30	40

31%

Task 15 Services structural components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	23	20	25	22	NV	17	5	17	40	20	10	25	20

20%

Task 16 Services operator station.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	20	30	25	21	NV	21	10	23	10	20	20	20	20

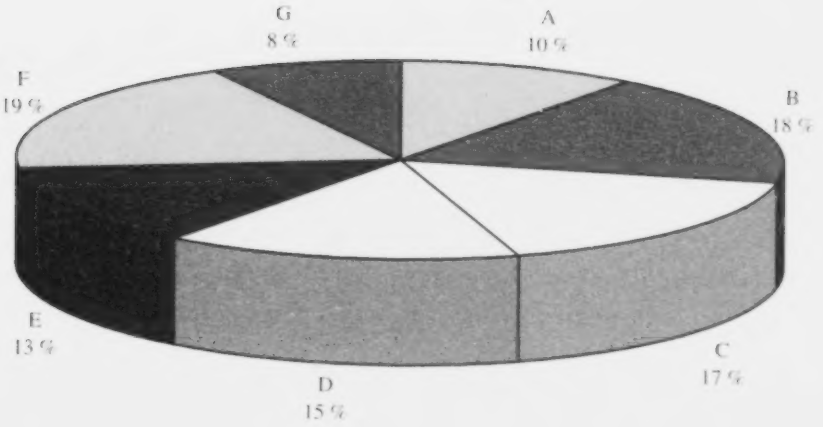
20%

Task 17 Installs, diagnoses and repairs attachments and accessories.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
%	27	40	25	24	NV	39	10	22	40	40	30	25	20

29%

PIE CHART*



TITLES OF BLOCKS

Block A	Occupational Skills	Block E	Steering, Suspension and Brakes
Block B	Engines and Engine Support Systems	Block F	Electrical and Electronic Systems
Block C	Hydraulic and Pneumatic Systems	Block G	Structural Components, Climate Control, Accessories and Attachments
Block D	Drive Train		

* Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 up to 150 multiple-choice questions on each examination.

HEAVY DUTY EQUIPMENT TECHNICIAN (2004)

	BLOCKS	TASKS	SUB-TASKS						
A	Occupational Skills	1. Uses tools and equipment.	1.01 Uses hand tools, power tools and equipment.	1.02 Uses measuring and testing devices.	1.03 Uses hoisting and lifting equipment.	1.04 Uses welding equipment.	1.05 Uses cutting equipment.	1.06 Uses heating/cooling equipment.	1.07 Uses cleaning equipment and agents.
		2. Performs maintenance and inspections.	2.01 Maintains fuels, lubricants and coolants.	2.02 Services fasteners, sealing devices, adhesives and gaskets.	2.03 Services hoses, tubing and fittings.	2.04 Services bearings and seals.	2.05 Services safety features.	2.06 Performs scheduled maintenance procedures.	2.07 Performs operational check-out.	2.08 Performs return to service check.
		3. Analyses and processes information.	3.01 Diagnoses operational faults.	3.02 Accesses service information.	3.03 Abides by regulations and standards.	3.04 Prepares/completes service related documents.			
B	Engines and Engine Support Systems	4. Diagnoses engines and engine support systems.	4.01 Diagnoses engine performance.	4.02 Diagnoses basic engine.	4.03 Diagnoses lubrication systems.	4.04 Diagnoses cooling systems.	4.05 Diagnoses intake and exhaust systems.	4.06 Diagnoses fuel systems.	4.07 Diagnoses engine control systems.
		5. Repairs engines and engine support systems.	5.01 Repairs basic engines.	5.02 Repairs lubrication systems.	5.03 Repairs cooling systems.	5.04 Repairs intake and exhaust systems.	5.05 Repairs fuel systems.	5.06 Repairs engine control systems.	5.07 Verifies repair of engine and engine support systems.
C	Hydraulic and Pneumatic Systems	6. Diagnoses hydraulic and pneumatic systems.	6.01 Diagnoses hydraulic systems.	6.02 Diagnoses hydrostatic systems.	6.03 Diagnoses pneumatic systems.				
		7. Repairs hydraulic and pneumatic systems.	7.01 Repairs hydraulic systems.	7.02 Repairs hydrostatic systems.	7.03 Repairs pneumatic systems.	7.04 Verifies repair of hydraulic, hydrostatic and pneumatic systems.			
D	Drive Train	8. Diagnoses drive trains.	8.01 Diagnoses clutch systems.	8.02 Diagnoses torque converters, fluid couplers and retarders.	8.03 Diagnoses driveline systems.	8.04 Diagnoses transmission and transfer case systems.	8.05 Diagnoses axle and differential systems.	8.06 Diagnoses final drive systems.	
		9. Repairs drive trains.	9.01 Repairs clutch systems.	9.02 Repairs torque converters, fluid couplers and retarders.	9.03 Repairs driveline systems.	9.04 Repairs transmission and transfer case systems.	9.05 Repairs axle and differential systems.	9.06 Repairs final drive systems.	9.07 Verifies repair of drive train systems.

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	BLOCKS	TASKS	SUB-TASKS								
E	Steering, Suspension and Brakes	10. Diagnoses steering, suspension and brake systems.	10.01 Diagnoses steering systems.	10.02 Diagnoses suspension systems.	10.03 Diagnoses braking systems.	10.04 Diagnoses wheel assemblies.	10.05 Diagnoses undercarriage systems.				
		11. Repairs steering, suspension and brake systems.	11.01 Repairs steering systems.	11.02 Repairs suspension systems.	11.03 Repairs braking systems.	11.04 Repairs wheel assemblies.	11.05 Repairs undercarriage systems.	11.06 Verifies repair of steering, suspension and braking systems.			
F	Electrical and Electronic Systems	12. Diagnoses electrical and electronic systems.	12.01 Diagnoses electrical systems.	12.02 Diagnoses electronic systems.							
		13. Repairs electrical and electronic systems.	13.01 Repairs electrical systems.	13.02 Repairs electronic systems.	13.03 Verifies repair of electrical and electronic systems.						
G	Structural Components, Climate Control, Accessories and Attachments	14. Diagnoses and repairs HVAC systems.	14.01 Diagnoses heating systems.	14.02 Repairs heating systems.	14.03 Verifies repair of heating systems.	14.04 Diagnoses ventilation systems.	14.05 Repairs ventilation systems.	14.06 Verifies repair of ventilation systems.	14.07 Diagnoses air conditioning systems.	14.08 Repairs air conditioning systems. (NOT COMMON CORE)	14.09 Verifies repair of air conditioning systems.
		15. Services structural components.	15.01 Diagnoses structural components.	15.02 Performs mechanical repairs on structural components.	15.03 Verifies mechanical repair of structural components.						
		16. Services operator station.	16.01 Diagnoses operator station components.	16.02 Repairs operator station components.	16.03 Verifies repair of operator station components.						
		17. Installs, diagnoses and repairs attachments and accessories.	17.01 Installs attachments.	17.02 Diagnoses attachments.	17.03 Repairs attachments.	17.04 Verifies repair of attachments.	17.05 Installs accessories.	17.06 Diagnoses accessories.	17.07 Repairs accessories.	17.08 Verifies repair of accessories.	